Stratospheric Parabolic Flight Technology

Problem Statement

- Conventional low-altitude aircraft parabolic flights have “g-jitter” due to atmosphere and engines.
- Proposed balloon-launched parabolic flight with existing HASS prevents 99% of the atmosphere from perturbing the zero-g test environment.
- Micro-gravity combustion, fire safety, life support systems, liquid propellant management technology, phase-change thermal loops, etc. can all use improved quality parabolas

Technology Development Team

- PI: Prof. Steven H. Collicott, Ph.D.
  School of Aeronautics & Astronautics
  Purdue University
  West Lafayette, IN
- Funding from
  School of Aeronautics & Astronautics
  Purdue University
- Near Space Corporation is keenly interested in the flight technology.

Proposed Flight Experiment

Experiment Readiness:

- The experiment will be ready for flight in October 2012. It is a duplicate of previous and current rocket-flight experiments.

Test Vehicles:

- Balloon with the HASS glider in a new flight path.

Test Environment:

- Purdue and Near Space will develop the stratospheric parabolic flight capability for the NASS vehicle. This new capability should provide extremely smooth periods of weightlessness.

Test Apparatus Description:

- Payload contains independent 3-axis accelerometer system and a self-triggering zero-g fluids experiment with high-def video. Photo is of previous rocket-flight version of the hardware being integrated to Armadillo STIG rocket.

Technology Maturation

- Multiple stratospheric parabolic arcs in one flight with g-levels low and documented by Purdue accelerometer system.
- A three-flight progression from demonstration of concept to readiness for science and education payloads.
- November 2012 first flight with third flight within a year of first flight.

Objective of Proposed Experiment

- Create the new zero-g testing capability and document performance.
- Flight data is 3-axis acceleration records and high-def video of propellant management technology demo experiments.
- Data will improve flight quality, provoke users of the new capability, and aid in design of superior propellant management and gauging systems.

Technology Areas TA8, TA6, TA2 are initial beneficiaries and all micro-gravity sciences also benefit.